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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
PAPPAS, PETER	
ART UNIT	**PAPER NUMBER**
2671	

DATE MAILED: 02/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO 90C (Rev 10/03)

Office Action Summary	Application No.	Applicant(s)	
	10/080,525	SHEKTER, JONATHAN	
	Examiner	Art Unit	
	Peter-Anthony Pappas	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 20 September 2004.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 6-45 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 22-25 and 42-45 is/are allowed.

6)☒ Claim(s) 6-13,15,16,18,20,21,26-33,35,36,38,40 and 41 is/are rejected.

7)☒ Claim(s) 14,17,19,34,37 and 39 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 21 February 2002 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Allowable Subject Matter

1. Claims 14,17,19,34,37 and 39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

2. In regards to claims 14 and 34 the prior art of record does not anticipate or suggest using the depth and surface geometry information for the one or more 3D objects to extend, on an output buffer pixel basis, the surfaces of the one or more 3D objects into an extended output buffer pixel; determining whether the extended surfaces of two or more of the 3D objects intersect over the extended output buffer pixel; and blending the colors of the one or more 3D objects with the color of the output buffer pixel as if two or more of the 3D objects intersected over the output buffer pixel whenever the extended surfaces of two or more of the 3D objects intersect over the extended output buffer pixel.

3. In regards to claims 17 and 37 the prior art of record does not anticipate or suggest determining a blend color for each uniquely layered time period by blending in depth sorted order the color of each of the one or more 3D objects with the color of the output buffer pixel according to each of the one or more 3D objects' transfer modes.

4. In regards to claims 19 and 39 the prior art of record does not anticipate or suggest determining the number and volume of each uniquely layered space-time region, wherein the volume of a uniquely layered space-time region is calculated for the

portion of the output buffer pixel and the portion of the shutter interval occupied by the space-time region, in combination with the other claim limitations, respectively.

5. Claims 22-25 and 42-45 are allowed.

6. In regards to claims 22 and 42 the prior art of record does not anticipate or suggest splitting the plurality of scan-converted 3D objects into one or more non-interacting object clusters, wherein a non-interacting object cluster is a cluster of objects that do not interact with each other or with any other cluster of objects, and for which there is a unique drawing order that goes correct visibility from a particular camera position for all objects in the cluster.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 6-12 and 26-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Griffin (Patent No. 5, 990, 904), in view of Pearce et al. (Patent No. 5, 809, 210).

9. In regards to claim 1 Griffin teaches a system and method for merging pixel fragments. Said system includes a rasterizer, a pixel engine, a pixel buffer and a fragment buffer, wherein geometric primitives are rasterized (scan-converted) to generate pixel data including pixel fragments. Said fragment buffer stores color, depth, and coverage data for partially covered pixels. Griffin teaches that if pixel fragments are

generated for a given pixel location (per pixel), the pixel buffer element corresponding to that location stores a pointer to the head of a list of the pixel fragments in the fragment buffer (column 4, lines 66-67; column 5, lines 1-26; column 19, lines 14-20; Fig. 2).

In the context of 3D graphics, the rendering process includes transforming the graphical models in a scene, and rasterizing the geometric primitives in the models to generate pixel data (column 2, lines 1-4). Griffin teaches that a pixel is a point or picture element in a display device, and in the context of graphics processing, also corresponds to a point in the 2D space (2D scene) to which the graphical models are rendered (column 1, lines 26-29).

Griffin fails to explicitly teach coverage as read in light of the specification (p. 6, lines 29; p. 7, lines1-13). However, Griffin teaches that the system supports a wide range of interactive applications and that its ability to support advanced real time animation makes it well-suited for games, educational applications, and a host of interactive applications (column 7, lines 1-4). Pearce et al. teaches the sampling model simulates an instantaneous shutter on a video camera. However, this form of sampling is satisfactory with scenes of low and moderate action, because unpleasant stroboscopic effects (e.g., jerkiness) are evident when rapidly moving objects are present. This results since computer generated animation lacks the real-world motion blur of a moving object (column 1, lines 20-28). In the present invention, motion blur simulation for an exposure interval is provided by analyzing the movement of tessellated representations of surfaces relative to a stationary sampling point on a pixel (column 1, lines 44-47). For example, consider FIG. 3 which illustrates the movement of a polygon

302 between the S_{open} (shutter open) and S_{closed} (shutter close) positions. During an intermediate period of time, polygon 302 covers pixel 310. An estimate of the time that polygon 302 covers pixel 310 can be provided by temporal sampling at one or more sampling points 312 (column 4, lines 23-33).

It would have been obvious to one skilled in the art, at the time of the applicant's invention, to incorporate motion blur utilizing a coverage technique involving shutter exposure times to improve the quality of animations, as taught by Pearce et al., into the method taught by Griffin, because Griffin teaches utilizing advanced real time animation in games and thus through such an incorporation a higher quality of animation and more life like animation would be able to be presented.

In regards to transfer mode Griffin teaches the scan convert block (rasterizer) in the tiler generates instances of pixel data representing: 1) fully covered, opaque pixels; 2) fully covered translucent pixels; 3) partially covered, opaque pixels; or 4) partially covered, translucent pixels (column 35, lines 48-52). Additionally, Griffin teaches Pixel engine 406 performs pixel level calculations including blending, and depth buffering (column 19, lines 14-20). It is noted that the applicant discloses that transfer mode is also known as blend mode (p. 6, ¶ 4). Blending consists of color transformations, wherein a plurality of colors can be combined via a plurality of means, and consists of such properties as opacity and translucency. Thus, the expectations of the claim are considered to be met.

In regards to surface geometry information (coverage mask) Griffin teaches that every fragment buffer entry stores a 4x4 pixel coverage bitmask for each pixel which is partially covered (column 34, lines 37-67; column 35, lines 1-16).

It is noted Tiler 200 and Gsprite Engine 204 are considered to comprise a motion buffer (Fig. 4A).

10. In regards to claim 7 Griffin teaches the pixel engine performs a depth compare operation on newly generated pixel data. If a generated pixel is occluded by the pixel in the pixel buffer, it is discarded. If the generated pixel is a fully covered pixel and is not occluded by the pixel in the pixel buffer, it replaces the pixel in the pixel buffer (column 5, lines 26-31).

11. In regards to claim 8 Griffin teaches that the memory management of the fragment buffer is performed using a linked list structure, wherein that each fragment buffer entry includes a pointer to the next fragment buffer entry. Multiple fragment buffer entries can be associated with a single pixel (via a linked list mechanism) for cases in which multiple polygons (for a given object) have partial coverage for the same pixel location (column 34, lines 33-63).

12. In regards to claim 9 the rationale disclosed in the rejection of claim 6 is incorporated herein. Griffin illustrates in Fig. 4A said motion buffer being received by the Alpha and Color Buffers (element 210).

13. In regards to claim 10 Griffin teaches that the scan convert block 394 includes interpolators for walking edges and evaluating colors, depths, etc. The pixel address along with color, depth and anti-aliasing coverage information is passed to the pixel

engine for processing (column 18, lines 42-47). Pixel engine 406 performs pixel level calculations including blending, and depth buffering. The pixel engine also handles Z-comparison operations required for shadows. To achieve optimal performance, the pixel engine should preferably operate at one pixel per clock cycle (column 19, lines 14-20). It is noted that Z comparison operations are considered depth sorting. It is also noted that shadows are considered an effect of blending color.

14. In regards to claim 11 Griffin illustrates in Fig. 9A that the output of fragment buffer 401 and the output of pixel buffer 408 are input into anti-aliasing engine 412. Griffin teaches that the anti-aliasing engine 412 calculates the color and alpha component for pixels which are affected by more than one polygon, which occurs when polygons only partially cover the pixel area (i.e. the polygon edges cross the pixel) or when polygons have translucency (column 19, lines 50-54). It is noted that data pertaining to said partially covered areas is stored in said fragment buffer.

15. In regards to claim 12 Griffin teaches that rasterizing generally refers to the process of computing a pixel value for a pixel in the image being rendered based on data from the geometric primitives that project onto or "cover" the pixel (column 2, lines 39-44). Fragment resolution is the process during which all of the fragments for a pixel are combined to compute a single color and alpha value. This single color and alpha are written into the color buffer (column 41, lines 53-66). Computing the resolved color includes accumulating a correctly scaled color contribution from each layer while computing and maintaining coverage information with which to scale subsequent layers (column 42, lines 1-4). Griffin fails to teach a weighted average of the blended colors.

Pearce et al. teaches that to determine the color value of pixel 200, a weighted or unweighted average of the color values of each of pixel sampling points 211-219 (and possibly including sample points from neighboring pixels) is determined (column 3, lines 60-67; column 4, lines 1-2).

It would have been obvious to one skilled in the art, at the time of the applicant's invention, to incorporate motion blur utilizing a specific coverage technique involving shutter exposure times to improve the quality of animations, as taught by Pearce et al., into the method taught by Griffin, because Griffin teaches utilizing advanced real time animation in games and thus through such an incorporation a higher quality of animation and more life like animation would be able to be presented.

16. In regards to claim 26 the rationale disclosed in the rejection of claim 6 is incorporated herein. Griffin teaches that the graphics support software 160 can include functions to support memory management, view volume culling, depth sorting, chunking, as well as gsprite allocation, transformation, and level of detail. The graphics support software can include a library of graphics functions, accessible by graphics applications, to perform the functions enumerated here (column 12, lines 11-16).

17. In regards to claim 27 the rationale disclosed in the rejection of claim 7 is incorporated herein.

18. In regards to claim 28 the rationale disclosed in the rejection of claim 8 is incorporated herein.

19. In regards to claim 29 the rationale disclosed in the rejection of claim 9 is incorporated herein. Griffin teaches that the graphics support software 160 can include

functions to support memory management, view volume culling, depth sorting, chunking, as well as gsprite allocation, transformation, and level of detail. The graphics support software can include a library of graphics functions, accessible by graphics applications, to perform the functions enumerated here (column 12, lines 11-16).

20. In regards to claim 30 the rationale disclosed in the rejection of claim 10 is incorporated herein.

21. In regards to claim 31 the rationale disclosed in the rejection of claim 11 is incorporated herein.

22. In regards to claim 32 the rationale disclosed in the rejection of claim 12 is incorporated herein.

23. In regards to claim 33 the rationale disclosed in the rejection of claim 13 is incorporated herein.

24. Claims 13, 15, 18 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Griffin (Patent No. 5, 990, 904) and Pearce et al. (Patent No. 5, 809, 219), as applied to claims 6-12 and 26-33, in view of Deering (Patent No. 6, 426,755).

25. In regards to claim 13 Griffin and Pearce et al. fail to explicitly teach depth of field blurring. Deering teaches since these effects (i.e. depth of field blur and transparency) tend to be highly dependent upon viewpoint location, the lack of hardware capable of performing these effects in real time prevents applications such as 3D games and simulators from taking full advantage of these effects. Advantageously, this configuration allows the graphics system to generate high quality images and to

selectively apply one or more of the effects described above (e.g., motion blur, depth of field, and screen door-type transparency) in real time (column 3, lines 13-30).

It would have been obvious one skilled in the art, at the time of the applicant's invention, to incorporate real time depth of field blur into video games so to improve the visual quality and the level of realism in said games, as taught by Deering into the system as taught by Griffin and Pearce et al., because by incorporating and applying said real time depth of field blur technique one would be able to achieve a higher quality of animation and visual presentation, which is more life as it is able to be processed and applied in real time.

26. In regards to claim 15 the rationale disclosed in the rejections of claim 11 and claim 13 are incorporated herein.

27. In regards to claim 18 the rationale disclosed in the rejection of claim 11 is incorporated herein.

28. In regards to claim 35 the rationale disclosed in the rejection of claim 15 is incorporated herein.

29. Claims 9, 16, 18, 29, 36 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCormack et al. (Pub. No. US 2002/0097241 A1), in view of Pearce et al. (Patent No. 5, 809, 210).

30. In regards to claim 9 McCormack et al. teaches a system and method for reducing memory and processing bandwidth requirements of a computer graphics system, by using a buffer in a graphic pipeline to merge selected mage fragments before they reach a frame buffer (p. 1, ¶ 2). An exemplary fragment 412 stored in the

fragment memory 482 includes a coverage mask 432, color values 434, depth value (Z depth) 436, Z gradient values (rate of depth of change), centroid offsets 440 and normal vector 442 (p. 8, ¶ 110).

McCormack et al. teaches that in a graphics pipelines a rasterizer circuit generates fragments in 3D space for an image having multiple surfaces that have been tessellated into primitive objects, such as triangles (p. 2, ¶ 17-18; p. 4, ¶ 60).

In regards to transfer mode McCormack et al. teaches that after processing in the merge buffer, the frame buffer update circuit 382 adds or blends each fragment output from the merge buffer 380 with previously-received fragments that correspond to the same pixel, and stores the resulting fragments in the frame buffer memory 366. The frame buffer update circuit 382 blends the colors of the new fragment and the existing stored fragments to generate a color of a pixel to output to the display (p. 6, ¶ 88). It is noted that the applicant discloses that transfer mode is also known as blend mode (p. 6, ¶ 4).

McCormack et al. fails to explicitly teach coverage as read in light of the specification (p. 6, lines 29; p. 7, lines1-13). Pearce et al. teaches the sampling model simulates an instantaneous shutter on a video camera. However, this form of sampling is satisfactory with scenes of low and moderate action, because unpleasant stroboscopic effects (e.g., jerkiness) are evident when rapidly moving objects are present. This results since computer generated animation lacks the real-world motion blur of a moving object (column 1, lines 20-28). In the present invention, motion blur simulation for an exposure interval is provided by analyzing the movement of tessellated

representations of surfaces relative to a stationary sampling point on a pixel (column 1, lines 44-47). For example, consider FIG. 3 which illustrates the movement of a polygon 302 between the S_{open} (shutter open) and S_{closed} (shutter close) positions. During an intermediate period of time, polygon 302 covers pixel 310. An estimate of the time that polygon 302 covers pixel 310 can be provided by temporal sampling at one or more sampling points 312 (column 4, lines 23-33).

It would have been obvious to one skilled in the art, at the time of the applicant's invention, to incorporate motion blur utilizing a coverage technique involving shutter exposure times to improve the quality of animations, as taught by Pearce et al., into the method taught by McCormack et al., because through such an incorporation a higher quality of animation and more life like animation would be able to be presented.

It is noted Merge Buffer 380 and Fragment Memory 482 are considered to comprise a motion buffer (Figs. 5, 7C, 10B). McCormack et al. illustrates in Fig. 5 said motion buffer being received by Display Driver 384.

McCormack et al. teaches that each fragment tuple includes a coverage mask 322 (surface geometry), with each bit of the mask indicating whether or not the fragment value applies to a corresponding one of the subpixel samples. Thus a fragment value with a coverage mask value of "1 0 0 0" corresponds to a fragment covering only subpixel S1, while a coverage mask value of "0 1 1 1" would indicate that the fragment value corresponds to a fragment covering subpixels S2, S3 and S4.

31. In regards to claim 16 the rationale disclosed in the rejection of claim 9 is incorporated herein.

32. In regards to claim 18 McCormack et al. teaches that the present invention enables a computer graphics system to render high-quality, antialiased images using a reduced amount of memory bandwidth and processing bandwidth (p. 3, ¶ 52).

33. In regards to claim 29 the rationale disclosed in the rejection of claim 9 is incorporated herein. McCormack et al. teaches that the graphics system 350 includes: a graphics accelerator 108 for receiving graphical commands from processing unit 102 (FIG. 3), processing the graphics commands to create a graphical image, and outputting the graphical image data in a format to be displayed; a graphics memory 122 including a texture memory 364 for storing image texture data and a frame buffer memory 366 for storing data regarding the next graphical frames to be displayed (p. 5-6, ¶ 80-83). It is inherent that commands issued to a processing unit are generated via a computer program stored on a computer readable medium.

34. In regards to claim 36 the rationale disclosed in the rejection of claim 16 is incorporated herein.

35. In regards to claim 38 the rationale disclosed in the rejection of claim 18 is incorporated herein.

36. Claims 20-21 and 40-41 are rejected under 35 U.S.C. 103(a) as being unpatentable over McCormack et al. (Pub. No. US 2002/0097241 A1) and Pearce et al. (Patent No. 5, 809, 210), as applied to claims 9, 16, 18, 29, 36 and 38, in view of Deering (Patent No. 6, 426,755).

37. In regards to claim 20 McCormack et al. and Pearce et al. fail to explicitly teach depth of field blurring. Deering teaches since these effects (i.e. depth of field blur and

transparency) tend to be highly dependent upon viewpoint location, the lack of hardware capable of performing these effects in real time prevents applications such as 3D games and simulators from taking full advantage of these effects. Advantageously, this configuration allows the graphics system to generate high quality images and to selectively apply one or more of the effects described above (e.g., motion blur, depth of field, and screen door-type transparency) in real time (column 3, lines 13-30).

It would have been obvious one skilled in the art, at the time of the applicant's invention, to incorporate real time depth of field blur into video games so to improve the visual quality and the level of realism in said games, as taught by Deering into the method taught by McCormack et al. and Pearce et al., because by incorporating and applying said real time depth of field blur technique one would be able to achieve a higher quality of animation and visual presentation, which is more life as it is able to be processed and applied in real time.

38. In regards to claim 21 the rationale disclosed in the rejection of claim 20 is incorporated herein.

39. In regards to claim 20 the rationale disclosed in the rejection of claim 20 is incorporated herein.

40. In regards to claim 41 the rationale disclosed in the rejection of claim 21 is incorporated herein.

Response to Arguments

41. The Objection to the Drawings has been withdrawn in lieu of applicant's remarks.

42. The Objections to claims 1, 6, 9, 22, 26, 29 and 42 have been withdrawn in lieu of the amended claims.

43. The 35 USC 112 1st paragraph rejection applied to claims 1, 6, 9, 22, 26, 29 and 42 have been withdrawn in lieu of the amended claims.

44. In response to applicant's remarks that Griffin fails to teach at least one of each scan-converted 3D object's rate of change of depth or surface geometry information the applicant is directed to the respective rejection of claim 6 above in which Griffin teaches the storage of surface geometry information (column 34, lines 37-67; column 35, lines 1-16). Furthermore, it is noted that the language "at least one of each scan-converted 3D object's rate of change of depth or surface geometry information" is considered to read as requiring either "rate of change of depth" or "surface geometry information" and not both.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter-Anthony Pappas whose telephone number is 703-305-8984. The examiner can normally be reached on M-F 9:00am-5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman can be reached on 703-305-9798. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Peter-Anthony Pappas
Examiner
Art Unit 2671

PAP

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